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*Simocephalus*. *Pseudo-sida bidentata* Herr. unites *Sida* and *Daphnella*. Mr. Herrick inclines to the opinion that the fauna of the states south of the Ohio River is a remnant of a pre-glacial one; while in the drift-covered areas a new circumpolar fauna has arisen, measurably independent of the previous one, though, of course, derived from it. The paper led to some discussion of geological evidence of the origin and persistence of types of fresh-water animals, and a comparison of the specialized phyllopod fauna of America with the cosmopolitan character of other fresh-water groups. — Mr. Warren Upham spoke of the progress made in cataloguing the plants of Minnesota, a work on which he is engaged. Much interest is shown by the botanists in all parts of the state in contributing material and notes. The total number of species of flowering plants and ferns now known to occur in Minnesota, growing without cultivation, is 1,527, belonging to 546 genera, which represent 115 families or orders. Of these, 125 species are intro-

## NOTES AND NEWS.

IN addition to the signal-service note mentioned in our editorial columns, there is another, no. vi., by the same author, on wind-velocities as determined during the summer of 1882, by hourly records of automatic anemometers at Chicago, and on the lake crib, three miles out on Lake Michigan, whence the city's water-supply is taken to the shore by a tunnel. The discussion shows the local peculiarities of the wind with much distinctness. The general ratio of velocity in Chicago to that at the crib is about 1 : 2, even though the anemometer in the city is a hundred and three feet above the ground, while that on the lake is only fifty-seven feet above the water; proving a marked control exercised by even so smooth a land-surface as that about Chicago in retarding the winds, — a control probably much strengthened by the buildings in the city. The diurnal variation of velocity is shown clearly at both stations: the maximum occur-

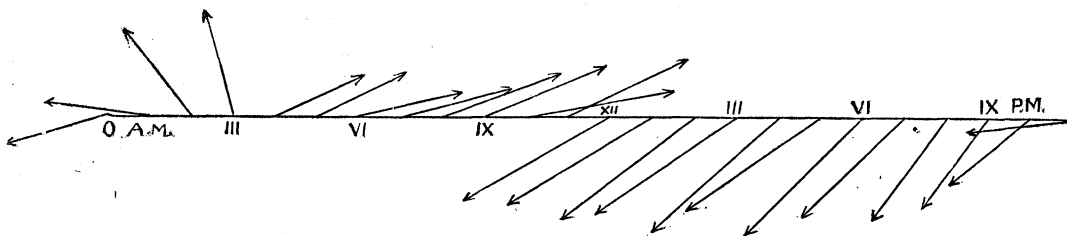


FIG. 1.

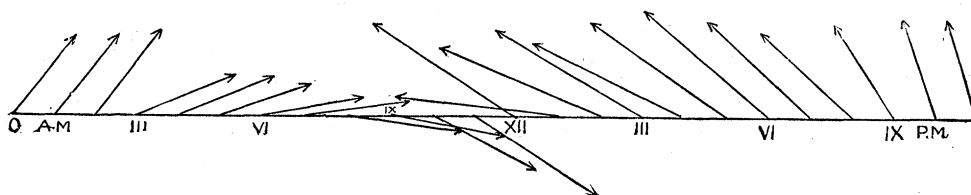


FIG. 2.

duced, being foreign plants that have become established or naturalized, leaving 1,402 that are aborigines. Up to the present time, only about half as many introduced weeds are known in Minnesota as in New England; the difference being due to the later settlement of the former section. — Mr. John B. Leiberger contributed a paper on plant-life in Montana and Dakota. It was stated that many species found were met with in the south-west only at high elevations. Their growth was of a luxuriance not seen in Minnesota. Only one kind of cherry was found west of the Missouri River along the line of the Northern Pacific, this being the little sandy cherry. Golden-rod was abundant. But one kind of pennyroyal was met. Fully one-half the grass found west of the Missouri was of one kind. Only two species of ferns, and but few mosses, were seen. The great number of fossil trees between Bismarck and Llandive was a fact of particular interest. From the stumps, some of them ten feet in diameter, the trees originally must have been of immense size.

ring about three or four in the afternoon, on land, and about four or five over the water; the minimum being rather uniformly maintained from ten in the evening, on through the night. The ratio of increase is much greater at the former (5.6 : 9.6) than at the latter station (11.5 : 13.5), as might be expected, both from the greater diurnal changes of temperature on land, and from the fact that at the time of maximum velocity on land the lake-breeze prevails. Directions are given only for the city station: they exhibit the phenomena of land and sea breezes in good form. The average of four months, here copied in fig. 1 with slight change, shows the south-west land-breeze from four in the morning till eleven; then there is an abrupt reversal to the north-east lake-breeze, which persists from noon till ten at night, followed by a gradual right-handed veering as the land-breeze is established again. The veering is found with greatest regularity in the July averages. Fig. 2 illustrates the immediate reversal from west-north-west to east-south-east at noon, followed by the

gradual hauling-around to west-north-west again in the succeeding twenty-four hours. The arrows are here drawn proportional to the velocities (maximum, 9.9 miles an hour; minimum, 5.6), as they should better have been in the original. The veering in the other months is much less regular. The little pamphlet affords excellent material for use in teaching, as well as for use in improving weather-predictions.

No. xi., by Lieut. F. K. Ward, of the same series of notes, treats of the elements of the heliograph, for use in military signalling, with the advantage of silently calling the attention of those to whom the signals are addressed without being visible to the enemy. No. xii., the latest of the series, by Sergeant J. K. Finley, is on the special characteristics of tornadoes, giving a concise description of their peculiarities. We should have been glad to see in it a statement of what the signal-service is attempting, in the way of tornado studies, by means of its special reporters.

—R. Baron, writing to *Nature* from Antananarivo, Madagascar, of a curious habit of insects, says, "One morning, while sitting by the side of one of these streams, I noticed a papilio, which is an insect measuring about four inches from tip to tip of its wings, resting on a wet bank; and, wishing to procure it as a specimen, I approached it as gently as possible, the creature being apparently so absorbed in what it was about as to be totally unconscious of my proximity to it. Noticing strange and unaccountable movements,—sundry jerks and probings with its proboscis,—I quietly sat down near it to watch it more closely. I observed that every second or two a drop of pure liquid was squirted (not exuded merely) from the tip of its abdomen. I picked up a leaf that was lying near, and inserted the edge of it between the insect's body and the ground, so as to catch the liquid. Unfortunately, I had no watch with me at the time, nor means of measuring liquids; but I reckoned that about thirty drops were emitted per minute. I held the leaf for about five minutes,—as nearly so as I could reckon,—and at the end of that time there was caught in it about a saltspoonful of what seemed to be pure water, without either taste or color. After watching the butterfly for a time, I seized it by the wings between my thumb and fingers with the greatest ease, so utterly lost did it appear to be to what was going on near it. In another spot I saw as many as sixteen of these large butterflies within the space of a square foot, all engaged in the same strange action."

—According to the London *Academy*, an ancient human skull has been found at Podhaba, near Prague. It was unearthed in a bed of chalk where the tusk of a mammoth had been dug out a few days previously, which gives an indication of its age. The characteristics of this skull are the extremely low forehead and the excessive development of the ridges, in both of which points it resembles the famous Neanderthal skull, though its facial angle is yet lower.

—The Entomological society of Washington has organized with the following officers: president, Dr. C. V. Riley; first vice-president, Dr. J. G. Morris;

second vice-president, George Marx; recording secretary, E. A. Schwarz; corresponding secretary, L. O. Howard; treasurer, Benjamin P. Mann; executive committee, the officers and Dr. W. S. Barnard, P. R. Uhler, and Dr. A. J. Shafhirt. The first regular monthly meeting of the society was held April 3, in the council-chamber of the U. S. national museum.

The active membership list of the society numbers over twenty names. Regular meetings are held on the first Thursday evening of each month.

—The pilot chart of the hydrographic office for April embodies several neat improvements on the preceding numbers. The printed supplement is replaced by a greater detail of conventional figures, with dates, printed in red on the chart; so that there is no longer necessity of looking elsewhere for needed information. The rig and attitude of wrecks are graphically represented, the name and date of observation being placed beside them. Wrecks observed more than once are plotted in all their positions with dates, and connected by a dotted line. Thus, from Jan. 7 to March 12, the schooner Maggie M. Rivers had drifted from off Cape Hatteras about five hundred miles east-south-east, obliquely across the ordinary course of the Gulf Stream. An intermediate position was noted on Feb. 6. One water-spout is recorded for March 3, two hundred miles east of Norfolk. It would be worth while to give the hour of such transient phenomena. Bergs and field-ice were very plentiful south-east of Newfoundland. Hereafter the charts will be sent to press the first of every month. The news of the previous month will be given as far as received, and any thing coming in later will appear on the next issue.

—It is rather late, but perhaps not quite too late, to call attention to the exceedingly important article by S. P. Langley, on the determination of wave-lengths in the invisible prismatic spectrum, in the March number of the *American journal of science*, simultaneously published, also, in the *Philosophical magazine* and some of the continental journals.

It gives the first, and so far the only, reasonably accurate wave-length determinations in the lower invisible portion of the spectrum. The results were obtained by a very ingenious and unexceptionable combination of grating and prism, and their correctness is beyond dispute within the limits of accuracy assigned. They show conclusively that the corresponding wave-lengths published by previous (and some contemporaneous) investigators are, at best, only roughly approximate, because founded on extrapolation from formulae which break down in the region of longer wave-lengths. The formulae of Redtenbacher, Cauchy, and Briot, were all investigated, and all fail; Briot's turning out the least inaccurate. Professor Langley's work makes it evident that the theory of dispersion needs revision and perhaps reconstruction.

Some of the results given in this article have been published before, within a year or two, in a fragmentary way, in the *Comptes rendus*, and in papers read before the National academy and elsewhere; but we

have now, for the first time, a connected statement of the whole investigation, which lays a foundation for future extended work in the same direction.

A casual reader would hardly be likely to appreciate the immense amount of labor involved in the research, both in observation and computation: but all acquainted with this sort of work will know that it must have been exceedingly laborious, tedious, and delicate; and specialists will await with great interest the publication of the unabridged memoir, in the Transactions of the National academy of sciences, with all the original records and details of the observations.

—In a paper published in *Van Nostrand's magazine*, Professor Thurston introduces a report, by Messrs. Brooks and Steward, on tests of an Otto gas-engine made at the Stevens institute of technology in the spring of 1883. The machine was furnished by the builders, and was subjected to a careful test, determining the method of distribution of heat, in useful effect and in wastes. Earlier determinations, under the direction of Professor Thurston, had been made, with results, in one case, given in illustration, as follows:—

Useful (dynamometric) work . . . . .	14.27
Work of pump . . . . .	0.42
Friction of engine . . . . .	4.10
Heat 'exhausted' from engine . . . . .	23.55
Heat wasted by water-jacket . . . . .	46.90
Loss by radiation, etc. . . . .	10.76
Total heat supplied . . . . .	100.00

The consumption of fuel varied from twenty-one to twenty-four and a half cubic feet per horse-power and per hour. The friction of mechanism was four or five per cent of the total energy of the fuel, or about thirty per cent of the useful power. The water-jacket carried off from forty-five to fifty-five per cent of the heat of combustion. The engine delivered seven to nine horse-power.

The trials of 1883, at the Stevens institute of technology, were made with an engine rated at ten-horse power. The air and gas were *both* measured by meter, — probably the first time that this had been attempted. It was found that the real proportions of air and gas were not determinable, except by metering both, as here done. The fact was proven that combustion continues, even after expansion has progressed to a very considerable extent, — a fact that had been before suspected, but probably never before proven. The distribution of heat was as follows:—

'Indicated' work . . . . .	17.00
In exhaust . . . . .	13.50
In water-jacket . . . . .	52.00
Lost by radiation, etc. . . . .	15.50
Total heat . . . . .	100.00

In the 'indicated' work are included useful work, and friction of engine, the latter amounting to about 0.20 of the former.

The cost of operation of the gas-engine is given at 8.75 cents per horse-power and per hour, — considerably more than the steam or the hot-air engine, when working continuously; but the comparison is more favorable to the gas-engine for discontinuous work.

The expense of the gas-engine will also be greatly reduced by the introduction of special 'heating-gas,' which can be supplied at one-half the cost of illuminating-gas.

The report affords an unusually full collection of valuable data for use in the construction of the theory of the gas-engine. It is remarkably well worked up, giving the equations of the expansion-lines; composition and specific heats of the gases; pressures, volumes, and temperatures at the various portions of the cycle; and all items of cost.

—At the meeting of the Linnean society of London, on March 6, Professor Cobbold gave a verbal account of a communication from Dr. P. Manson of Hong Kong, in which the author furnishes fresh evidence as to the rôle of the mosquito considered as the intermediary host of *Filaria sanguinis-hominis*. Dr. Manson has verified his previous observations in the most complete manner, and he now recognizes and describes six well-marked stages of the Filariæ whilst they are dwelling within the body of the insect. In the discussion following, Dr. T. R. Lewis confirmed Manson's statements in many particulars.

—M. Tisserand, assisted by MM. Bijourdan, Calandreaux, and Radau, issued on Feb. 15 the first number of a new astronomical monthly, entitled 'Bulletin astronomique,' to be published under the auspices of the Paris observatory.

—*Nature* announces that at the final meeting, March 21, of the general committee of the International fisheries exhibition, the balance of the funds was disposed of. The surplus amounts to over £15,000; and of this, £10,000 were allotted to alleviate the distress of widows and orphans of sea-fishermen, while £3,000 were voted as an endowment to a society which is to be called 'The royal fisheries society,' whose functions will be somewhat similar to those of the Royal agricultural society. The remaining £2,000 are kept in reserve.

—For the purpose of a scientific inquiry into the amount and fluctuation of the rainfall in different parts of the world, A. R. Binnie, Town Hall, Bradford, Yorkshire, Eng., wishes to collect long and continuous records of rainfall extending from as early a date as possible. 1°. The records should state the annual falls only, as taken year by year without a break, for periods of at least fifteen years; but the longest possible period is most desired. 2°. The name of the place of observation, with, if possible, the latitude and longitude, and its elevation above the sea-level, should be given. 3°. The total annual fall should be expressed in millimetres, English inches, or local or obsolete measures; but if in either of the latter, their equivalent in millimetres or English inches should be given. 4°. The name of the observer, or authority, or publication from which the record is obtained, should be given. 5°. The records should be from observations made at a single station, and should not be compiled from the records of two stations; but the greatest number of different records taken at different stations is desirable, to avoid local errors or peculiarities.

— The gunpowder-mills owned by Messrs. W. H. Wakefield & Co., near Kendal, Eng., are now lighted by the electric light; they being the first works of the kind where this mode of illumination has been adopted. The works are very extensive, at least two miles in length. The dynamo is placed about the centre of the works. Very long mains were necessary, as each dangerous building is about two hundred yards from its neighbor. Over head, bare wires were found to be the best for conveying the current. These were carried on insulators on posts and trees along the route, four to eight lamps being necessary to each. The lamps used are the new pattern, twelve-candle power Swan lamps. The dynamo runs almost continuously day and night in the winter, the average work per day being at least twenty hours. In the dangerous powder-making sheds the lights are enclosed in specially designed copper reflectors, enamelled white inside, with tight-fitting plate-glass fronts. Each lamp is under separate control, and each circuit can be controlled by a switch in the machine-room. Every lamp and every circuit is also protected by a safety-plug, which melts in case of danger through excess of current; thus breaking the current, and removing all possible danger.

— The rainfall in San Diego, Cal., and also throughout southern California, is greater for the present season of 1883-84 than has ever been previously recorded. A total of 18.46 inches has fallen at San Diego, and as high as 60 inches have been reported from the back country. The rainfall for 1879-80 was 14.89 inches; 1880-81, 9.30 inches; 1881-82, 9.47 inches; and for 1882-83, only 4.91 inches.

— The Indians in Oregon are much disturbed by the constant settling of whites on lands which they have occupied, and which have enabled them to gain a living by horse-raising. They recently asked for a hearing for their grievances from the commander of the fort at Walla Walla, which was granted. They were told, however, that their only remedy was in taking the land as individuals, and not as members of a tribe. But as they have scruples about dealing in mother-earth, from which they all come, and to which they return, the prospect is at present that they will be finally driven from all land outside their reservation.

— Professor Ormond Stone, now of the University of Virginia, resigned the position of astronomer of the Cincinnati observatory in June, 1882; and upon his advice, his former assistant, Mr. Wilson, now astronomer *pro tempore*, has devoted himself chiefly, since that time, to the reduction of the miscellaneous observations which remained unpublished. No. 7 of the publications of the observatory, a pamphlet of 79 pages, contains those observations which pertain to comets, and is divided about equally between observations of cometary positions and physical observations. Previously to 1880 this observatory paid no attention to these bodies, the equatorial (Merz and Mahler, 11 $\frac{1}{4}$  inches aperture) being principally engaged with double-star observations. The former publications of this observatory (Nos. 1-6)

relate entirely to discoveries and micrometrical measurements of double stars.

The observations of position were made after the usual manner, mostly with the filar, but sometimes with the ring-micrometer, and need no further mention here. The assumed co-ordinates of a hundred and fifty-four comparison-stars are given also. The physical observations, generally made just before or after the observations of position, consisted of sketches, measures, and notes on the appearance of the comets. Sketches of the heads of comets were made with the large equatorial, using a power of about a hundred diameters. The tail-sketches were made with the unassisted eye, and sometimes an opera-glass. All the stars visible in the vicinity of the comet were plotted upon the pencil-sketches as accurately as possible with the eye. The stars were afterward identified in Heis's *Atlas Coelestis*, and plotted to a scale three times that of the engravings. The position of the nucleus was then plotted, and the tail drawn in the same proportion, relatively to the stars, as on the original sketch. In the process of photo-engraving, the compiled sketches were reduced to one-third, so that the engravings are about the same size as the original sketches.

The theory and methods of discussion of tail-observations of comets, elaborated by Dr. Bredichin, director of the observatory of Moscow, have been followed by Mr. Wilson; and he summarizes that theory from *Copernicus* and the *Annales de l'observatoire de Moscou*.

The discussions of the notes on the several comets form a very interesting contribution to cometary astronomy. The plates accompanying the work contain about thirty drawings of comet (b) 1881, twelve of comet (a) 1882, and twenty of comet (c) 1882, commonly known as the great comet of that year; and they appear to have been reproduced in a manner worthy of the accuracy of the originals.

— In the French journal, *La ramie*, M. Paillex calls attention to a Japanese plant named Kusu (*Pueraria Thunbergiana*), the roots of which contain starch, while the leaves and shoots are used as food. Its fibrous portions are adapted for use in the manufacture of cordage. It is a lofty and hardy plant, attaining within a year to the height of between twelve and twenty-five feet. It yields fruit, and grows upon the most unfruitful dry ground, where nothing else would thrive, provided there is a sufficiency of warmth. It requires no care, and can be propagated by seeds or by planting.

— The Chinese are beginning to adopt western chemical science, and a factory has recently been erected for the manufacture of sulphuric acid on a large scale. Two well-known chemical text-books — Malguttis' *Elementary chemistry*, and the *Chemical analysis of Fresenius* — have also been translated into Chinese, with the help of a great number of new characters, and adopted in the imperial colleges. His excellency Tong Kin Sing, the first minister, has taken the work under his immediate patronage, and written the preface for the first of these books.